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ABSTRACT

A project to implement the theories of Jean Piaget in elementary school curricula, teacher inservice training, and college preservice training with 11 school districts, a college, and New York State Education Department was described in this paper. The change in the program scope from a teacher introduction to Piaget's theory focusing on acquisition of conservation and helping the teachers develop programs, to the approach of planning a total program which integrated Piagetian theory into the entire elementary program was traced. A pilot program consisted of 4 parts: a tape-slide presentation to be viewed by teachers, a summer workshop, a limited implementation of the program, and development of a plan for full implementation of Piaget's theory. The pilot program focused on logical-mathematical operations, specifically seriation, numeration, and classification. Plans for future development were also presented. (PS)

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PROJECT IMPLEMENTATION: A COOPERATIVE VENTURE UTILIZING PIAGETIAN THEORY

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Introduction

With most presentations on Piaget's theory, there is usually the direct or implied observation that this theory is or should be applicable to education. However, you don't find that many systematic applications to public school classrooms. Our purpose is to describe a project to implement the theories of Jean Piaget into elementary school curricula, teacher inservice training, and college preservice training with 11 school districts, a college and the state education department.

First, our area is in northern Chautaqua County, the westmost corner of New York State. This is an economically disadvantaged area, similar to north central Michigan and is included in the Appalachian Region.

Across the 11 participating school districts, from 10-29% of the children are from poverty homes, and unemployment ranges from 4-20%. Of the poverty heads of households, 32.4% of those between 20-49 years old, and 49% of those between 50-59 years old are unemployed.

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Median income for all employed persons in the county in $2,850, and median family income for the county is $4,943 as compared to a median family income for upstate New York of $5,212. The income and the following school achievement data come from two Chautauqua County studies. The picture which emerges is one of a low-income area.

With regard to achievement for students and their parents in this area, there are positive and negative signs. On the positive side, records from the New York State Pupil Evaluation Program for Fall 1971 indicated that percentile scores for third, sixth and ninth grade students in reading and math do not vary from percentile scores for the state by more than 1 point. However, for the years 1968-1970, the cumulative dropout rate from grades 7 through 12 was 28.6%. 48.7% of the poverty heads of households have completed 8 years or less of school and 33.1% have completed less than 12 years of school. About 1/3 of the identified poor are dropouts.

Program Development

Focus on compensatory education. Consequently, when we began planning a school-college program to help children, we were thinking primarily in terms of compensatory education. At that point, we were not contemplating anywhere near the utilization of Piagetian theory that we are now, and began by reviewing compensatory programs as reported in the literature. This review resulted in many descriptions of programs and activities to help children. Few of the program descriptions contained evidence, such as statistics concerning academic gains for students. We were struck by the size of the federal investment in compensatory education programs - considering only Title I, ESEA, this has amounted to $5.5 billion for the 1966-1970 period. The other striking conclusion from the review was the lack of evidence as to effectiveness of these programs. As you know, this issue has attracted a lot of attention

lately.

Results of programs. Much of the research indicates no gain at all as a result of even rather intensive compensatory education programs. In 1969, Fowler showed a slight gain when teaching conditions were improved, and the United States Commission on Civil Rights, reporting on over 20 programs, showed no significant intellectual gains. Crisculolo, DiLorenzo and Salter and Long in 1967 found that less disadvantaged children tend to gain more than seveny disadvantaged children from the same program.

The problem of"effectiveness". Now this issue of the effectiveness of compensatory education programs, or of educational programs in general, is more complicated than it first appeared. On one hand, there are the very throughly researched arguments of Arthur Jensen to the effect that compensatory education programs have failed to equalize differences between advantaged and disadvantaged children, and on the other hand, more moderate observations by other individuals. Edmund Gordon , who has been responsible for much of the Head Start program and its evaluation, and David Hawkridge, who has conducted national surveys of compensatory education programs, have observed that few compensatory programs are carefully designed and controlled, although some have been successful. For example, in 1968, Hawkridge and others made a national study, reviewing over 1000 programs, and were able to identify 21 in which there were significant gains.

To return to the question of program effectiveness, in the Hawkridge study, "effectiveness" was defined as occuring when children in the program gained 1/3 of a standard deviation either over a control group or national norms. This would be an example of statistical evidence of program effectiveness and represents the best that we have.

In view of the striking differences in achievement between "advantaged"

and "disadvantaged" children, discussed by Jensen at the American Educational Research Association in Chicago last month, the effective programs could still be called failures. (Incidentally, Jensen wasn't really able to deliver this paper because of the verbal abuse from a minority of those present and I am speaking from the printed version). Still, on the topic of apparent failure and apparent success in educational programs, the Office of Economic Opportunity recently conducted a study of performance contracting in public schools. As most of you probably know, this study "showed" that performance contracting had not worked, another "apparent failure." Nearby here, however, in Grand Rapids, where there has been some use of performance contracting, I understand that there are more schools under contract with outside firms this year than there were last year.

The conclusion that I am leading up to is that, although evidence about educational program effectiveness is needed, you still have to evaluate the evidence that you do find. The net result is that there are fewer effective programs than the apparent evidence would indicate and you are left with the feeling that a really effective program would not likely look like most present programs.

Decision to utilize Piaget's theory

At this point, we were ready for an innovative idea, but it hadn't come yet. We were still interested in developing an effective compensatory education program, and continued to study programs. I keep mentioning compensatory programs and "apparent" successes and failures to be historically honest. Our conceptualization has evolved from a strictly"compensatory" program to a total program. The relationship between apparent effectiveness and what now seems like effectiveness parallels a process that Piaget describes as

occuring with the transistion from pre-operational to concrete operational thought, and that normally happens with six to eight year old children!

Our study of effective programs indicated differences between programs in terms of ages served, personnel, and time of the day or year, but several similarities in operation. These several similarities boiled down to about two. First, the programs which had statistically significant effectiveness were very specific. There were specific objectives and teaching practices which were relevant to these objectives, and individualized instruction based on diagnosis. The second quality of the effective programs was an orientation toward cognitive development, rather than cultural enrichment.

This left us with the feeling that we should have an individualized, diagnostic program with specific objectives. There were already programs like this in existance, and it didn't look at this point as if we would have anything really special, fresh and innovative to offer. There seemed to be something cumbersome about all the testing, and it still seemed as if we wouldn't be getting after the real problem, of how to develop an effective, humanized program to really meet the needs of children. There was a consistent emphasis on the need for structured programs, but this seemed to be an imposed structure, which was not necessarily related to the needs of children. The central problem, although we didn't realize it until about then, was the empirical, rather than theoretical model suggested by the literature compiled so far.

There is a growing awareness of the possibility of many tests and school programs being culturally biased. For example, we think of the elementary school environment as being more supportive of girls, expecially middle class girls, than boys, and of intelligence tests as discriminating against black children. There is no widely accepted theoretical model of intellectual develop, or what intelligence actually is. Most of us have heard the expression

that intelligence is what the Wechler or Stanford intelligence test measures, but that is the most widely used operational definition of intelligence. When you think of it, we are really limited in our planning of school programs, of what content to be taught when, and how to teach it. These decisions are being made, obviously.

At times you may want to go beyond "what does everyone want to teach" and "what are the other people doing" to "what seems to work out best?" When you try that though, where are you?

I've described a rather painstaking approach to identifying "what seems to work out best." Even after identifying what seemed like effective programs, we still couldn't tell why these things worked. Or, to put it another way, when you adopt an empirically developed practice, you have no real basis for knowing whether this practice will work in another locale, or if it doesn't, whether it is because of the fault of the practice or its application.

It was about at this time, about a year and a half ago, that we decided to investigate using Piaget's theory as a basis for the program to be developed.

The appealing thing about Piaget's theory initially was the notion of a sequence of stages. I had a personal interest in this approach, stemming from my experiences teaching sixth grade. I remembered one success and two consistent failures. The success came in teaching baseball. Most of the girls and some of the boys were very poor baseball players. Working in groups of three, on throwing, batting and catching, it was amazing how quickly their proficiencies increased. Steepest learning curves I've ever associated with. They were old enough, and the coordination was there so it was just a matter of practice on basics. The failures were with latitude and longitude in social studies, and with common denominators in math. Some of the children understood these at the beginning of the year, and still understood latitude and longitude at the end of the year, in spite of me. A few did learn that year.

There was another group, though, that as St. Paul said about Anthony the coppersmith, "withstood our works mightily." In retrospect, it now appears that the reason for my failures with latitude and longitude and common denominators was that in attempting to teach these children, I had just provided alternative explanations at the same level, rather than in going back to a previous level or levels and giving them practice on basics, as I did with baseball. Still it is easier to identify basic skills in baseball than in science, math, social studies, or language arts, or it was for me then.

Development of the present program

Description of the early program. In the fall of 1970, we submitted a proposal to the Appalachian Regional Commission for funds to conduct a summer institute for teachers. This institute would have been on Piaget's theory and its application to the classroom. The objectives for this institute would have included teacher attitude, Piaget's theory and curriculum revision. Specifically, the institute was planned for K-2 teachers, and acquisition of conservation was the main aspect of Piaget's theory contemplated at that time, with some attention to be paid to classification. This would have been eight weeks long, with a four-week program for children during the middle four weeks. Three months before and after the institute, both teachers and children would have been tested. Attitude toward children was to be the teacher measure, and acquisition of classification skills and conservation were to be the student variables. Interest in such a program was expressed by both teachers and administrators.

Implementation, not demonstration. The people at the Appalachian Regional Commission were also interested.. One member of the Education Activities Staff, with whom we had our first dealings, Dr. Eugene Hoyt, had invested about five

years in the implementation of Piaget's theory into educational practice while he was school superintendent at Brentwood, Long Island. Dr. Hoyt felt that to implement Piaget's theories into school practice would require more than just a summer training program, and suggested the investment of a year in planning, to result in the formation of a consortium between the school districts, the Board of Cooperative Educational Services or BOCES, the college and various specialists. This was a major change in the nature of the program, from a summer institute to a program of planned change for the school districts, the college, and the BOCES organization. Another major change, although less immediate, was from a compensatory program to a program for all primary grade children. This occured because support from the Appalachian Regional Commission is noncategorical, consequently, our program developed from a compensatory program consisting of a summer teacher institute, to an eleven-district wide, total program, at least in planning.

BOCES. BOCES is a rural, county-wide educational organization. BOCES offers specialized classes which the districts do not have enough students for, and is also a coordinating organization. Dick Miga, the director of instructional projects for the BOCES in our area, will describe the organization and its function more fully.

Meetings with administrations. A little under a year ago, in June of 1971, a proposal was submitted for a planning grant, and in January of this year we received a contract for a planning grant for the year of 1972. Since last fall, the planning activities have consisted of developing a preliminary, Piagetian-theory based curriculum, and many meetings with the school districts, BOCES, the college, the state education department and experts on Piaget's theory. As a result of a continued review of the literature and many meetings and discussions with these people, the scope of the proposed program broadened considerably.

Needs. Several trends had become apparent. Nationally, there is an increasing demand for accountability in all education programs, an increased interest in competancy-based certification, and concern for the "whole child." Within New York State, our own commissioner of education, Ewald Nyquist, has repeatedly emphasized the need to "humanize" education. Although these haven't gone into widespread practice yet, there have been four developments at the state level. There are preliminary developments of competency based certification, one responsibility of the Bureau of Inservice Education,[1] an encouragement of open classroom or open education through the Bureau of Elementary Curriculum,[2] encouragement of individualized instruction through the Bureau for Education for the Gifted,[3] and what is called "Educational Redesign."[4] Educational redesign is not keyed on any particular curricular appraoch, but rather with a reexamination of the total program. Incidentally, both redesign and competency based certification projects are supposed to be cooperative enterprises including all of the people involved.

Discussions with both state education department people and school administrators indicated a readiness for a total program, and a sense of urgency, almost crisis. (Here I am describing my own reactions, rather than quoting anyone directly.)

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The revised curriculum

The scope of the program had increased by now, from the original approach. We had begun with the idea of giving the teachers an introduction to Piaget's theory, focusing on acquisition of conservation for the children, and helped the teachers develop programs much like training studies in the acceleration of conservation. In terms of the school program, this would have been part of primary grades science.

By the time the proposal was submitted to the Appalachian Regional Commission, we had decided to plan the children's curriculum around the content areas of logical-mathematical operations, and physical-scientific and social-relational concepts, corresponding approximately to the curriculum areas of math, science and social studies. During the fall, we decided that it seemed like a better idea to plan a total program, integrating Piagetian theory into the total elementary program.

We're still talking about the planning now. Implementation comes later. The most appealing approach was to plan a school program around children's and teachers' needs, not to impose something. The work of Abraham Maslow was utilized in determining "from a distance" what children's need were. Maslow's theory of growth motivation includes the premise that people's motivations can be conceptualized in terms of physiological needs, needs for safety, belongingness and love, exteem, self-actualization, desires to know and understand and aesthetic needs.

Classroom social structure. With maturity, our relations change from egocentrism to relativism, or, in other words, toward an increased appreciation of other people. In this context, then, we expect the program to improve children's social relations as reflected by the classroom social structure.

Children's self esteem. This program will have to be individualized in order to work. Each child should be working at about hisown level, which would

mean that he ought to have a pretty good success rate with his tasks, which generally makes children feel good about themselves. Other things that the children should have going for them, in addition to the success experiences, are the more helpful social climate, and the instructional emphasis on understanding and process.

Academic achievement. Within Piaget's theory, there is no distinction between learning, intelligence and creativity. Separate tests for these are considered artifacts of test development, rather than evidence of separate factors of mental abilities. All of these should be influenced by the program.

Summary. This is an outline of the major concepts of the program, and their major dimensions and what would be measured as evidence for success or failure.

Concept	Dimension	What would be measured
1. Health	Total potential health program	Utilization of programs available, school health program
2. Social Relations	Classroom social structure	Cohesiveness Positive or negative affect
3. Self Esteem	Self Esteem	Self Esteem
4. Achievement	a. Traditional academic achievement	Reading, math science, social studies
	b. Piaget's content areas	Logical-mathematical Physical-scientific Social-relational

Achievement con't.	c. Creativity	Creativity
	d. Aesthetics	Aesthetic production e.g. - art

The pilot project

So far, the program has been described in very general terms, which brings us up to March of this year. Two important things were still to be done - to involve teachers, and to make local, specific applications. These were to be combined in the pilot program. The major purpose of the pilot program is to give participating teachers some experience with the theory, both in assimilating the theory into classroom instruction, and also in accomodating their instruction to the theory.

Development of the pilot program. There are four parts to the pilot project. First, we developed a tape-slide presentation describing developments on the program so far and presenting a tentative curriculum. As of last Friday, a series of presentations was made to teachers at 9 of the 11 participating districts between April 27 and May 4. At the conclusion of each presentation, the teachers were assessed as to their interest in participation in such a program. Responses have been obtained from 114 of a target group of 124 teachers. Of these 114 responses, 107 expressed an interest in learning more about Piagetian theory, and 90 indicated interest in the summer workshop.

Next, a summer workshop will be offered for some of these teachers in all of the participating districts. This workshop will include an introduction to the theory, a review of the preliminary curriculum, a revision of part of what will be taught in the fall to include aspects of Piaget's theory, and plans to implement this new aspect of the curriculum in the fall. Experiences with

children to test out these new learnings will also be included in the summer workshop.

Third, in the fall, there will be a limited "try out" program in which teachers in one or two of the participating schools will utilize what was learned at the summer workshop, with assistance and evaluation to be provided by the college.

The final step of the pilot program will be to develop a plan, in cooperation with the school districts, BOCES and the college for the full implementation of Piaget's theory. The plan for full implementation will require a committment of public schools, BOCES and college resources, even with outside support.

Consequently, the most improtant product of the pilot program would be a strong personal committment by all of the participants.

Curriculum for the pilot program

We've mentioned a "preliminary curriculum" several times. When the proposal was submitted last June, we had conceptualized three major categories for certain aspects of Piagetian research which would be appropriate for an elementary school curriculum. These were: logical-mathematical operations, physical-scientific, and social-relational, roughly corresponding to math, science and social studies. Appropriate assessment, scalogram and training studies were reviewed and descriptions of sequences, assessment and training procedures were developed for these three areas. However, two problems presented themselves. First, Piaget's theory did not lend itself to compartmentalization within those curriculum areas. Second, it was not possible to develop complete descriptions of sequences of development, assessment procedures and training procedures in all content areas for all levels of development through a review of the literature.

Therefore, we have returned to more of a process approach, and plan to utilize two major categories of content areas - logical-mathematical operations and symbolic representation. These will be applied to the total curriculum including reading and language arts, math, science and social studies. Our pilot program will be focused on logical-mathematical operations, specifically seriation and numeration and classification.

Seriation and numeration

Using seriation and numeration as the example, we will describe this part of the theory and its application to our own teaching situations. Seriation refers to the child's ability to build elements into a transitive, asymmetrical series. That is to say, a child who can seriate can, given a collection of objects, order them in some way. This could be from little-to-big, for collections, from few-to-many, or from thick-to-thin.

Numeration is the child's ability to assign numerals to elements which have been classed and ordered. It is, essentially, a counting ability, but different from the younger child's "counting." At about the time the child enters the stage that Piaget calls concrete operations, this numeration or counting ability is operationalized so that the child can use it in solving problems. Taking an example from a study described by David Elkind in 1964, a child is given a situation of a doll on a "stairway" which may be constructed out of different length blocks or sticks. Numeration refers to the child's ability to tell how many steps the doll would have had to climb to get to that point on the stairway, even if the stairway is "destroyed" by rearranging the items.

Sequences of development. Piaget has observed sequences in the development of both seriation and numeration. Taking seriation as an example, and utilizing procedures from the same study by Elkind referred to previously, we will describe the levels and assessment procedures, with training or teaching procedures

from other studies. For illustrative purposes, approximate ages are used in all of the following examples. The only trouble with doing this is that using ages as an example conveys an impression of more orderly sequences of development than is actually the case.

Early behavior. The young child, who may be 4 or 5 years old, usually has a general impression of a "series" as a kind of global figure, but with the whole and parts undifferentiated.

For example, if a child is presented with a stairway, and the stairway is "destroyed" the child acts as if he no longer believes in its existence, and can not reconstitute it.

On the other hand, the same child can discriminate between smaller and larger items or objects, and can pick out the largest or smallest item, even if it is disguised in some way, such as standing a smaller object on end to make it look bigger.

If the child is given two or three items, he can generally put them in a series, but four and more generally present an insolvable problem to him.

Later development. Later, a child of, say, about 5 years of age, has attained what Piaget calls intuitive representation of the series as a whole, recognizing differences between the parts, but not seeing the parts as being related. A typical problem situation, would be to ask the child to order 9 sticks of varying length into a series.

This is essentially ranking the sticks or slats, but the child of this age typically treats it like a jigsaw puzzle. Whether the objects look the same or not, the child treats each object as if it were unique.

If you were to arrange the blocks into a stairway, then scramble then up and ask the child to make a stairway "like yours," the child would be able to do this, but not easily. It would likely be done with a trail-and-error approach. These children are not as systematic as we would expect them to be,

and appear to be experimenting with relations that are very obvious to an older child or adult.

It is usually impossible for a child of this age to integrate additional elements into the first set, after the set has been completed. After a child at this stage has completed a seriation problem with the first 9 objects, if he is presented with another set of objects to "nest" inside the first set, he can not do this. It is as if he regards the completed series as complete and unalterable. There are three common responses to the task of inserting the new elements into the completed series. First, he can insert the new objects into the existing series without paying any attention to size relations. Second, objects can be exchanged rather than added. Third, the child can construct a new series, either on top of the previous series or next to it.

Seriation in the concrete operational child. At this point, the child has developed from what Piaget calls an intuitive concept of a series to an operational concept of a seires (Elkind, 1964). The description of "operational concept of a series" should also illustrate something of what Piaget calls operational thinking, as opposed to the preoperational thinking which has been used to describe the younger children. At this point, given the same problem of seriating the 9 sticks, the child generally constructs the series quickly, making few errors, and can do so from either direction. That is he can go from short-to-long or from long-to-short without difficulty. The theory explains his speed and efficiency through the operational character of his thinking now. By now, the process or ordering size relations has become a mental operation, rather than something that has to be done physically, step-by-step.

By the same token, the problem of inserting the new series into the existing order is solved quickly. The child has a mental operation of ordering

any collection of objects into a series, and this operation can be applied to additional objects. Previously, a series was something that was constructed, by trail-and-error, and the "completed" series was bound to a specific collection of objects and could not be transferred.

Another aspect of seriation, transitivity, can be illustrated with similar materials. After a child has identified that A< B and B<C, the teacher can present the child with A and C, holding the ends so that the child can not tell by looking which is longer and ask him to tell which is longer.

Children with these abilities can also order objects in terms of more than one variable, for example, longer and thicker, or shorter and thicker.

Description of teaching procedures. In describing seriation, we have also alluded to the materials used and assessment procedures. By now it should be evident that seriation is an important operation. The question is, how can a child be helped to attain this ability?

Typically, training procedures give a child practice with the same kinds of materials used in assessment. There is also discussion, with the child, about his choices. As an example of some teaching procedures, we have taken the following examples from a training study by Celia Stendler Lavatelli.

For an objective of teaching a child to arrange 10 or more elements in a series on the basis of one variable, size, ten cardboard cutouts of flowers were used. These cardboard flowers varied somewhat in size.

The teacher would question each child about his choices: "Is this flower larger than the small one?" "Is it smaller than this next one?" The child learns the terms smaller than and larger than through superimposing one flower on another for a size comparison.

A related task concerns the ability to arrange 2 or more series of objects so that they are in a one-to-one correspondence with each other. This can be done with, for example, 9 blocks, and 9 dowels, (or 5 dolls, 5 animals and 5

balls). With this task, the child first seriates one of the objects, for example dolls, then selects the proper corresponding object for each element in the series.

The children can also be given practice in inserting additional elements by using one of the objects to be seriated. For example, the teacher can give the child 8 of the objects, and, after the child has arranged the 8 elements in a series, the teacher "finds" the additional doll or dowel and asks the child to insert it in its proper place. The teacher also asks the child to justify his choice.

The child may not utilize information such as "it is smaller than this one and bigger than that one" in his reply. In this case, the teacher would ask the child to compare the new element with both of the adjacent objects so that the child eventually verbalizes the solution to the effect that if the new doll is smaller than that doll and larger than this doll, then it's got to be in the right place here.

Returning briefly to the earlier discussion of compensatory education, here is an opportunity for the teacher to utilize what information he or she may have with regard to the children's life-space. The objects selected for the child to practice seriating should be familiar to him.

Another practice involves arranging geometric shapes into 2 series at a time, by size and by shape. The children have to learn the names of the figures, and to describe how each differs. The learning of names is a practice, drill-type learning, rather than the problem solving, learning normally associated with Piagetian research.

After the children have learned the names, they are given 4 triangles ranging from 1 inch to 4 inches on a side to seriate.

The children may then be given all four geometric shapes to seriate on the basis of number of sides.

The final step of this particular training procedure is for the children to be presented with all 16 figures "to arrange so that it will be easy to find the one that's the smallest and has the least number of sides or find any other one." The child is asked to explain what he is doing and why, with the teacher asking questions which call attention to each variable.

Future development

In these examples, the teaching procedures are very similar to the testing procedures, a not uncommon educational approach. The main differences between what we have just talked about and conventional teaching is that there is more individualized attention, and the teacher asks questions, rather than giving directions most of the time. We will be developing additional teaching procedures, expecially ones which could be used with small groups, rather than requiring an adult to work with the child on a one-to-one basis.

In the next few months, there will be several parallel activities. The summer and fall program has been described. Briefly, the other activities will consist of a continued review of appropriate curricular materials, and the literature on scalogram and training research, further meetings with teachers, administrators, school boards and members of the community to determine the degree of support for the program, and submission of proposals to funding agencies.

The full program will include both teacher inservice and preservice training. The classroom organization will probably include aspects of the open classroom approach, and differentiated staffing, and be relatively informal. We plan to begin with the teacher inservice program. During the first two years of the public school inservice program, the college preservice program will also be revised, so that the preservice program resembles the inservice pragram. By the third year, there should be student teachers from

the preservice program having their practice teaching experience with graduates of the inservice program.

This part of the program description has been relatively brief, since the full program will involve many different individuals and agencies, all of whom will participate in its design.

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